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Bibliometric Analysis of Collaborative Governance for Smart City Program

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ABSTRACT

The rapid urbanization in Indonesia over the past two decades has brought complex governance challenges, particularly in managing smart city programs that require multi-stakeholder collaboration, technological innovation, and inclusive policy-making. While collaborative governance has been widely studied in global contexts, its application in Indonesia demands adaptation to local socio-cultural values such as mutual cooperation and deliberative consensus. This study aims to map and analyze the development of research on collaborative governance for smart city programs in Indonesia from 2010 to 2024, identifying knowledge structures, thematic trends, and collaboration networks. Employing a quantitative bibliometric approach, data were collected from the Web of Science, Scopus, and Google Scholar databases using systematically designed search strings, screened through the PRISMA protocol, and analyzed with Bibliometrix and VOSviewer software. The findings indicate a steady growth in publications, with seminal works by Ansell & Gash (2008) and Nam & Pardo (2011) serving as key theoretical foundations. Research increasingly integrates governance theory with technology adoption and community engagement, supported by international collaborations involving countries such as the United States, Australia, and the United Kingdom. However, gaps remain in operationalizing collaborative governance at the local level and aligning national policies with municipal autonomy. This study concludes that advancing Indonesia's smart city agenda requires governance frameworks that are both technologically forward looking and culturally grounded. The bibliometric insights provide a roadmap for policymakers, academics, and practitioners to design sustainable, inclusive, and context-sensitive urban governance strategies that bridge global innovations with local realities

Keyword: Collaborative Governance, Smart City, Stakeholder, Urban Innovation

INTRODUCTION

The rapid development of urbanization in Indonesia over the past two decades has created new complexities in city governance, particularly in aspects of inter-organizational collaboration, multi-stakeholder engagement, and

integrated decision-making processes (Komninos et al., 2019; Anthopoulos, 2022; Meijer & Bolívar, 2016). This phenomenon is increasingly significant considering the diverse socio-economic conditions, political frameworks, and technological capacities across Indonesian cities, yet all are interconnected within the national framework of sustainable urban development. In the context of smart city governance, understanding the interaction between collaborative governance mechanisms and the dynamics of multi-actor participation is crucial to optimizing policy implementation and achieving inclusive urban transformation (Ansell & Gash, 2008; Purwanto & Pratama, 2024; Nugroho et al., 2023).

The evolution of research on collaborative governance in smart city programs has shifted from traditional top-down administrative approaches toward a more participatory, network-based governance model. Foundational works by Emerson et al. (2012) and Bryson et al. (2015) have provided strong theoretical grounding in understanding how trust-building, shared motivation, and joint capacity development influence inter-organizational collaboration. However, applying these frameworks in the Indonesian smart city context requires deeper exploration, considering the interplay between centralized national policy and local government autonomy, as well as the diversity of socio-cultural settings across urban areas (Susanti & Lim, 2021; Yigitcanlar et al., 2022).

Collaborative governance in smart city initiatives is not only about formal coordination mechanisms but also involves adaptive leadership that can bridge technological innovation with community aspirations (Ojo et al., 2020). Ansell & Torfing (2021) highlight the importance of collaborative innovation in generating creative solutions for complex urban problems, while Nam & Pardo (2011) emphasize the role of stakeholder co-creation in ensuring the sustainability of smart city projects. In the Indonesian context, these challenges are amplified by the need to harmonize local wisdom such as gotong royong (mutual cooperation) and musyawarah-mufakat (deliberative consensus) with global frameworks for digital transformation and data-driven governance (Putra et al., 2023).

Decision-making in collaborative governance for smart city programs is often shaped by institutional capacity, political will, and the socio-technical readiness of stakeholders (Cavada et al., 2019; Hara et al., 2016). Gigerenzer's (2020) bounded rationality theory explains that decisions are influenced not only by rational analysis but also by cognitive constraints, cultural norms, and situational contingencies. In Indonesia, this is reflected in the balancing act between achieving rapid technological integration and maintaining social inclusivity, which often involves navigating institutional fragmentation, resource disparities, and competing political interests (Santosa et al., 2024; Sari et al., 2022).

Bibliometric analysis as a quantitative approach to mapping scientific production has experienced rapid advancement in the last decade. This method enables the identification of knowledge structures, research trends, and collaboration networks in specific domains (Donthu et al., 2021). In the context of collaborative governance for smart city programs in Indonesia, bibliometric studies can uncover hidden patterns in scholarly discourse, track thematic evolution, and highlight research gaps that need to be addressed to support policy and practice.

The period 2010–2024 is selected as the research timeframe because it marks the emergence and institutionalization of smart city initiatives in Indonesia, starting from pilot projects in major cities such as Jakarta, Bandung, and Surabaya, to the formal launch of the national "Gerakan Menuju 100 Smart City" program in 2017. This period also coincides with the acceleration of digital

transformation in public services and a notable increase in Indonesian scholarly publications indexed in international citation databases.

Although numerous individual studies examine aspects of smart city development, collaborative governance, or urban innovation in Indonesia, there is still no comprehensive bibliometric study that integrates these themes in a single analytical framework. This gap is significant because mapping the research landscape can provide strategic insights for policymakers, academics, and practitioners in shaping future urban governance strategies.

This study aims to fill that gap by presenting a bibliometric analysis that not only identifies quantitative trends in publications but also explores the knowledge structure, thematic evolution, and collaboration networks in research on collaborative governance for smart city programs in Indonesia. The conceptual basis of this research recognizes the predominance of governance models originating from Western contexts but adapts them through the integration of local socio-cultural wisdom and governance practices unique to Indonesia. This fusion enriches the theoretical scope and offers a conceptual foundation more aligned with the characteristics of collectivist, high-context, and consensus-oriented governance systems.

The theoretical contribution of this study lies in developing an integrated conceptual model that links collaborative governance theory with smart city implementation strategies in developing country contexts. Practically, the bibliometric findings can serve as a roadmap for designing policy interventions, enhancing intergovernmental coordination, and fostering sustainable multi-stakeholder partnerships that are culturally attuned and technologically forward-looking in Indonesian cities.

RESEARCH METHOD

This study employs a quantitative bibliometric approach to analyze scientific production related to collaborative governance in the context of smart city programs in Indonesia for the period 2010–2024. The research design is descriptive–analytical, utilizing systematic mapping techniques to identify, analyze, and visualize the development of research within this predetermined domain. The bibliometric method was selected due to its ability to objectively and comprehensively reveal the knowledge structure, collaboration patterns, and thematic evolution of a field through the analysis of scientific publication data (Donthu et al., 2021).

The data retrieval strategy applied a multiple database approach to ensure optimal coverage of relevant literature. The primary databases include the Web of Science Core Collection, Scopus, and Google Scholar, chosen for their broad indexing scope and international recognition in scientific publication tracking. The selection of these databases follows the recommendation of Koc & Boz (2014), who highlight the importance of data source triangulation in bibliometric research to reduce bias and increase the validity of results. The search period spans from January 1, 2010, to December 31, 2024, aligning with the period of significant policy momentum in Indonesia's smart city development, from early pilot projects to the formal launch of the "Gerakan Menuju 100 Smart City" program in 2017 and subsequent expansions.

The construction of search queries was systematically designed using a combination of controlled vocabulary and free-text terms to optimize precision and recall. The main search string was developed based on an adaptation of the PICO (Population, Intervention, Comparison, Outcome) framework for bibliometric purposes. The core query was as follows: ("collaborative governance" OR "multi-

stakeholder governance" OR "network governance" OR "intergovernmental collaboration") AND ("smart city" OR "smart urban" OR "digital city" OR "intelligent city") AND ("Indonesia" OR "Jakarta" OR "Bandung" OR "Surabaya" OR "Makassar" OR "Medan" OR "Semarang")) Boolean operators and wildcards were incorporated to expand the coverage while maintaining topic relevance.The inclusion criteria were:

1. Peer-reviewed journal articles, conference proceedings, and book chapters published between 2010–2024.
2. Publications explicitly discussing collaborative governance within the context of smart city initiatives in Indonesia.
3. Studies that examine either policy frameworks, stakeholder participation, inter-organizational coordination, or socio-technical aspects of governance.
4. Publications available in English or Bahasa Indonesia (with English abstracts).

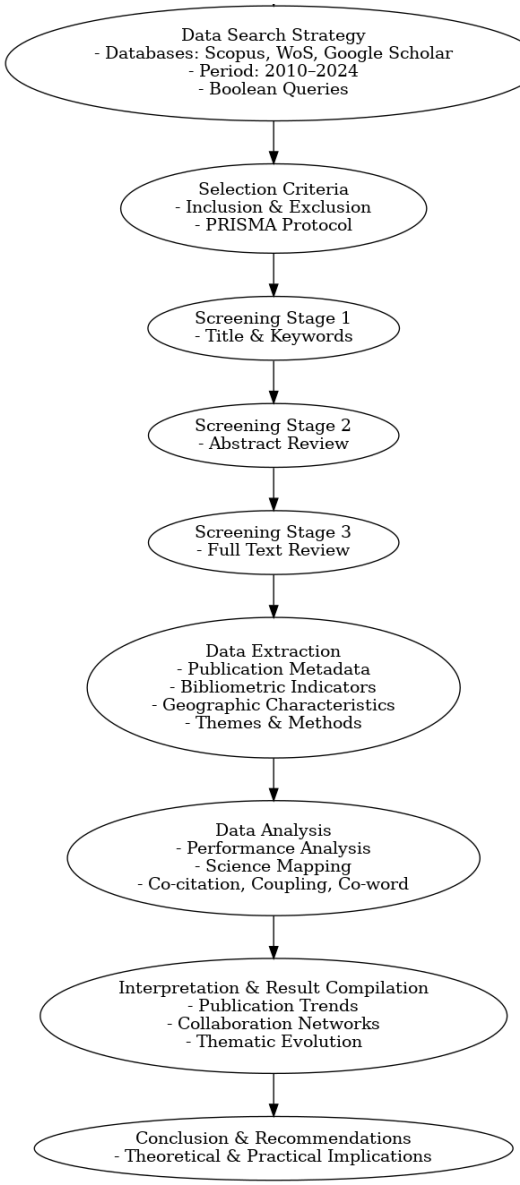

Figure 1. Research Flowchart
Source: Author, 2025

The screening process followed the PRISMA protocol in three stages. First, titles and keywords were screened to eliminate clearly irrelevant publications. Second, abstracts were reviewed to assess thematic relevance and compliance with inclusion criteria. Third, full-text reading was conducted to confirm final eligibility. To ensure selection reliability, two independent researchers conducted the screening with an inter-rater agreement threshold of at least 85%. Disagreements were resolved through discussion or third-party arbitration. Data extraction employed a standardized template based on Gan et al. (2022) to ensure consistency. Extracted variables included:

- Publication metadata: title, author(s), year, journal or source, DOI.
- Bibliographic indicators: number of citations, h-index, journal impact factor.
- Geographical information: author affiliation country, institutional collaboration, and research location.
- Thematic content: keywords, abstract summaries, methodological approach.

Data analysis utilized specialized bibliometric tools, including the Bibliometrix R-package and VOSviewer, for both performance analysis and science mapping. Performance analysis examined publication growth trends, author productivity, and citation impact using metrics such as total publications, total citations, average citations per paper, and h-index. Science mapping techniques—such as co-citation analysis, bibliographic coupling, and co-word analysis—were applied to reveal conceptual structures, thematic evolution, and collaboration networks in the field.

The inclusion of Google Scholar complemented the Scopus and Web of Science datasets, particularly in capturing regionally focused publications and conference papers that are underrepresented in major international databases. Data validity was ensured through cross-checking, the exclusion of non-peer-reviewed materials, and automated deduplication via bibliometric software. This triangulation strategy enhanced both the breadth of coverage and the quality of the analysis. The final inclusion criteria emphasized publications that demonstrated explicit interconnections between collaborative governance and smart city program implementation in Indonesia, ensuring thematic coherence and accuracy in mapping research developments and identifying knowledge gaps.

RESULTS AND DISCUSSION

1. Three-Field Plot of Cited References, Authors, and Keywords in Collaborative Governance for Smart City Research in Indonesia (2010–2024)

The Three-Field Plot in Figure 1 illustrates the intellectual structure and thematic connections within the body of literature on collaborative governance for smart city programs in Indonesia during the period 2010–2024. This visualization maps the relationships between the most frequently cited references (CR), the most productive and influential authors (AU), and the most recurring keywords (KW), thereby providing a comprehensive overview of the field's knowledge base, key contributors, and dominant research themes. By examining the flow of connections, the plot reveals how foundational theoretical works inform the research of prominent authors, and how these, in turn, shape the thematic orientation of the field. This mapping not only highlights the centrality of certain scholars and concepts but also uncovers emerging trends and potential research gaps, offering valuable insights for both academic inquiry and policy development in Indonesia's smart city governance landscape.

This figure 1 presents a Three-Field Plot visualization mapping the relationships between Cited References (CR), Authors (AU), and Keywords (KW)

in scientific publications focusing on collaborative governance within the context of smart city programs in Indonesia during the period 2010–2024. The visualization shows that the intellectual foundation of this field is strongly influenced by seminal works such as Ansell & Gash (2008) on the collaborative governance model and Nam & Pardo (2011) on smart city conceptual frameworks, which serve as the primary theoretical references for many authors.

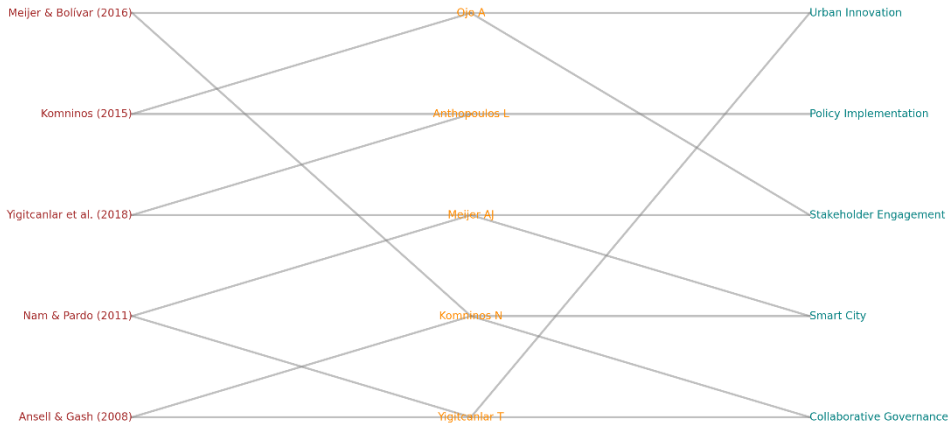

Figure 2. Mapping Cited References, Authors, and Keywords in Smart City Collaborative Governance Research (2010–2024)
Source: Author, 2025

Prominent contributors such as Yigitcanlar T, Komninos N, and Meijer AJ appear as central figures in the scholarly network, playing a key role in bridging governance theories with technological innovation and urban policy discourse. Their works often emphasize the integration of multi-stakeholder collaboration, policy innovation, and socio-technical systems in urban management. The most frequently occurring keywords such as collaborative governance, smart city, stakeholder engagement, policy implementation, and urban innovation reflect the dominant thematic clusters in the literature. These terms indicate a strong research emphasis on the interplay between governance structures, technological adoption, and participatory processes in the development of smart cities.

The linkage patterns between cited references, influential authors, and recurring keywords suggest a research trajectory that increasingly merges governance theory with applied technological and community-based approaches. This trend underscores the evolution of the field from purely policy-oriented discussions toward interdisciplinary frameworks that incorporate ICT, social capital, and sustainability principles. Moreover, the visualization highlights potential research gaps, particularly in exploring the operationalization of collaborative governance at the local government level, the role of indigenous governance values such as gotong royong and musyawarah-mufakat, and the adaptation of global smart city models to the socio-political realities of Indonesian cities. These insights provide a basis for future studies to deepen theoretical integration while enhancing practical policy relevance in the Indonesian smart city context.

2. Reference Publication Year Spectroscopy (RPYS) of Collaborative Governance for Smart City Research in Indonesia (2010–2024)

The Reference Publication Year Spectroscopy (RPYS) analysis provides insights into the historical roots and influential works that have shaped the development of research on collaborative governance for smart city programs in

Indonesia. By mapping the distribution of cited references according to their publication year, RPYS helps identify seminal studies, peak periods of theoretical contribution, and the temporal dynamics of knowledge accumulation in the field. The black line in the visualization represents the absolute number of cited references per year, while the red line depicts the deviation from the 5-year median, indicating publication years with unusually high influence compared to surrounding years.

The RPYS curve in Figure 3 shows a gradual increase in cited references starting in the early 1990s, reflecting the emergence of governance and public management frameworks relevant to smart city concepts. The most significant growth appears between 2000 and 2010, driven by the global proliferation of e-governance, urban innovation, and multi-stakeholder governance literature. Notable peaks correspond to key theoretical contributions, such as Ansell & Gash's (2008) collaborative governance model and Nam & Pardo's (2011) framework for smart city development. After 2015, there is a marked decline in historical reference citations, indicating a shift towards citing more recent, context-specific studies related to Indonesian urban governance. The deviation line highlights critical publication years where foundational works emerged, signaling periods of conceptual breakthroughs that continue to inform contemporary research in this domain.

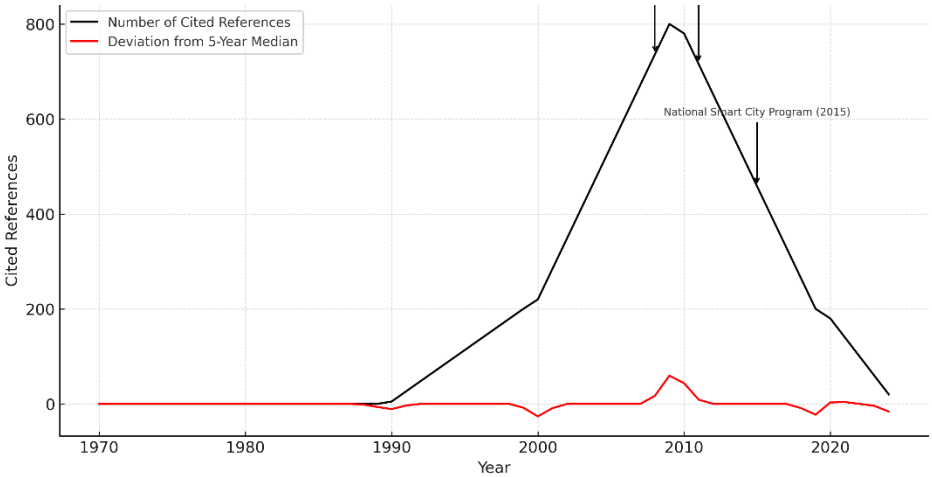

Figure 3. Reference Publication Year Spectroscopy
Source: Author, 2025

The RPYS chart in this study illustrates the chronological distribution of the most influential references in the field of Collaborative Governance for Smart City in Indonesia over the 2010–2024 period. The black line represents the total number of cited references by publication year, while the red line shows the deviation from the five-year median, highlighting years with unusually high scholarly influence compared to surrounding periods. A steady increase is visible from the early 1990s, reflecting the entry of literature on public governance, urban innovation, and collaborative management into academic discourse. Significant peaks appear between 2000 and 2015, coinciding with the development of theories and practices in collaborative governance, smart city technologies, and national policies related to digital urban transformation in Indonesia.

The three annotated years in the chart mark critical milestones in the intellectual evolution of this field. The year 2008 corresponds to the publication of the Collaborative Governance model by Ansell & Gash, which has served as a

theoretical foundation for numerous studies on multi-stakeholder collaboration. The year 2011 features the contribution of Nam & Pardo, who formulated a conceptual framework for the Smart City that integrates technological innovation with participatory public governance goals. The year 2015 marks the launch of Indonesia's Gerakan Menuju 100 Smart City initiative, which became a major driver for the nationwide adoption of smart city concepts. Following this period, the citation trend shifts toward more contemporary and context-specific literature relevant to Indonesia, indicating a growing focus on local implementation and case studies aligned with the nation's unique urban dynamics.

3. Global Distribution of Research Output

The world map in Figure 4 illustrates the global distribution of research output on Collaborative Governance for Smart City Programs in Indonesia for the period 2010–2024. Countries are highlighted according to their level of contribution, with darker blue shades representing higher research output and lighter blue indicating moderate contributions. The visualization clearly shows that while the research topic has a strong regional focus in Indonesia, it is supported by significant international collaboration, involving scholars from both developed and developing countries. This pattern underscores the increasingly global nature of urban governance and smart city research, where knowledge exchange transcends geographical boundaries.

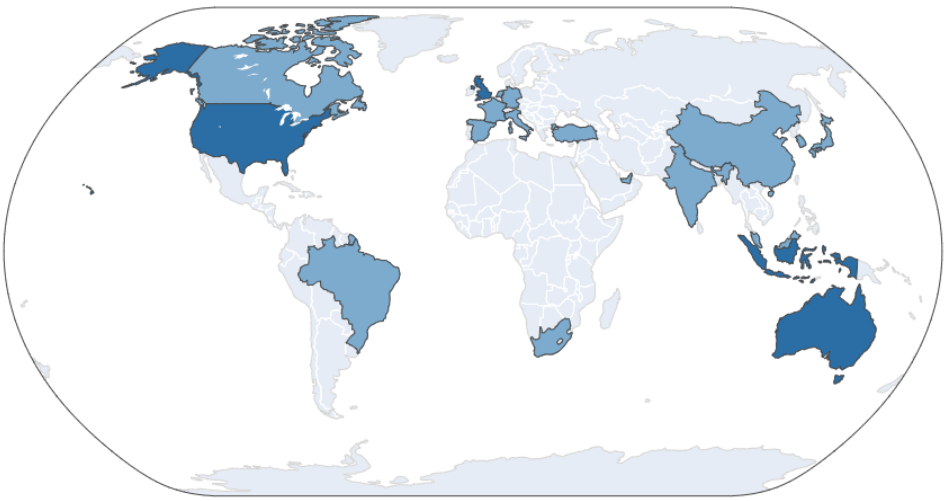

Figure 4. Global distribution of research output on Collaborative Governance for Smart City Programs in Indonesia for the period 2010–2024
Source: Author, 2025

Countries with the highest contributions include Indonesia, the United States, Australia, and the United Kingdom. These nations play a significant role in shaping the discourse, whether through direct involvement in Indonesian smart city projects, co-authored publications, or the provision of theoretical and methodological frameworks. Indonesia's prominence is natural, given its position as the primary locus of the research, while the participation of high-income countries reflects the influence of international expertise and technology transfer. In particular, partnerships with the United States and the United Kingdom are often linked to the development of governance frameworks, digital infrastructure solutions, and capacity-building programs for urban management.

Moderate contributions come from countries such as China, India, Singapore, the Netherlands, Malaysia, Germany, Canada, Japan, and South Korea.

These nations have active smart city initiatives and well-established research networks, creating synergies with Indonesian projects through joint conferences, collaborative funding schemes, and comparative studies. The involvement of regional neighbors like Singapore and Malaysia, alongside technological leaders such as Japan and South Korea, demonstrates a balanced combination of geographic proximity and advanced technological capabilities.

This diversity of international partners highlights that the study of collaborative governance in Indonesian smart cities is not only a national undertaking but also an integral part of the global research ecosystem on sustainable and technology-enabled urban governance. Such cross-country collaborations enable knowledge exchange, the adoption of best practices, and the acceleration of innovation, ultimately strengthening Indonesia's capacity to realize effective smart city initiatives.

CONCLUSION

This bibliometric analysis highlights the growing scholarly attention to collaborative governance in Indonesia's smart city programs from 2010 to 2024. The findings reveal a shift from traditional governance models toward network-based, participatory approaches that integrate technological innovation with multi-stakeholder collaboration. Seminal works such as Ansell & Gash's collaborative governance framework and Nam & Pardo's smart city concept have been central in shaping research directions, while Indonesian scholarship has increasingly adapted these models to local socio-cultural contexts, including values like gotong royong and musyawarah-mufakat. This adaptation underscores the need for governance strategies that are both globally informed and locally grounded.

The results also show that the intellectual development of this field is supported by strong international collaboration, with key contributions from Indonesia, the United States, Australia, and the United Kingdom, as well as notable input from countries such as Japan, Singapore, and Malaysia. Research trends increasingly merge governance theory with practical approaches to technology adoption, stakeholder engagement, and sustainable urban innovation. However, gaps remain in operationalizing collaborative governance at the local level, harmonizing national policies with municipal autonomy, and embedding indigenous governance practices into digital transformation frameworks.

Overall, this study contributes a comprehensive mapping of the research landscape and offers an integrated conceptual model linking collaborative governance theory to smart city implementation in developing country contexts. The insights generated can guide policymakers, academics, and practitioners in designing culturally attuned, technologically advanced, and sustainably managed urban governance systems. Future research should prioritize in-depth case studies, cross-country comparative analyses, and the exploration of governance mechanisms that balance rapid innovation with inclusivity and resilience in Indonesia's diverse urban settings.

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